DENTAL SEPSIS: ITS RELATION TO THE SYSTEM.[1]

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The cases upon which the following observations are based presented purulent infection in and about the teeth. The terms used in literature to indicate this condition are oral sepsis, Riggs' disease, pyorrhea alveolaris, dental sepsis, dental abscess, necrosis, etc. By the internist these terms are very loosely used, and one must turn to works upon dentistry to get any accurate information of the nature and extent of the *local* process. Even in such works, however, there is no adequate explanation of the relation of these variously situated foci to each other. Works on internal medicine contain as yet no comprehensive discussion of this subject, and its causative relation to some of the most destructive systemic processes (arthritis, endocarditis, etc.), a relationship which we know to be of primary importance in the consideration of the etiology, diagnosis, and therapeutics of these conditions. It is the duty of the internist to familiarize himself with this focus of pyogenic infection *in its early stage* and to coöperate with the dentist as with the surgeon in the eradication of foci of pus in any part of the body. The teeth, especially at the pulp, may, like the tonsillar, peritonsillar, and deep urethral tissues, harbor pyogenic organisms and even small amounts of virulent pus without local manifestations, although systemic manifestations having apparently no relation to this source appear from time to time, and may reach a crippling or fatal degree. It is this latent or subtle quality in the local infection which causes it to be frequently overlooked or discounted by the internist. Such foci can often be detected by radiographic examination only. In one instance (Case I) the only manifestation was a slight crepitation of the left temporo-maxillary joint, which was unaccompanied by pain or tenderness. There was slight ear pain, for which the patient consulted an aurist. This, and the unusual sound in opening and closing the jaw, was the only complaint. The radiograph showed a pulp abscess. The tooth was removed and a pure culture of Streptococcus viridans was obtained from the pulp, socket, and gum, and the blood gave positive complement fixation for the same organism. There was no fever at any time and no leukocytosis. Vaccines were prepared from this tooth, but were not used at the time, as conditions did not seem to justify doing so. A few months later general arthritis developed and the autogenous vaccine was immediately employed, with marked benefit, but not with entire disappearance of the arthritic manifestations. The blood still showed positive fixation for the same organism. On further search, another tooth was found, with small pus focus, and on removal of this there was rapid improvement, with ultimate disappearance of the arthritis. The manifestations of arthritis were pain on motion, active and passive, and slight tenderness on deep palpation, but no redness or local fever. The knees, ankles, wrists, elbows, and small joints of the hand were involved. The temporomaxillary joint was, however, the only one permanently damaged, and in consequence the crepitation persists (see case reports, Case I). This case well illustrates the slow, steady absorption, with destruction, unless the focus is detected and the process checked. It is always possible in the protracted cases in which no removal of the focus or other checking of the infection is carried out, for new foci to develop in the joints or soft tissues. Under these circumstances the condition may become progressive, consequent to but independent of the original focus and often hopelessly destructive to the joints or visceral tissues. The persistence of the temporomaxillary joint signs in the case just cited makes it possible that here may be a new focus of infection which may appear in other localities later. Several such new foci, even though the original focus has been drastically treated by removal of the tooth and by curettement, make the clinical problem one of difficulty, disheartening the patient and baffling the physician. Vaccines under these circumstances are the only rational therapeutic remedy. This case demonstrates the importance of close coöperation between dentist and internist. This obligation to coöperate rests as much with the dentist, if not more so, as with the internist. The dentist may find a tooth abscess with which, in most instances, he deals mechanically. Later the internist sees the same case, and though he may associate the history of the diseased tooth with the sytemic disturbance which he now finds, it is often impossible, at that late date, to accurately correlate the two processes. The dentist in most instances does not make cultural studies of the pus, and thus the only opportunity of detecting the invading organism and of preparing vaccines may be lost. If, as seems likely, vaccines prove to be the only certain means of combating these destructive pyogenic infections in their advanced stages, the loss of the opportunity to procure this important therapeutic agent would be a serious and culpable omission.

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[1] Presented at the meeting of the Association of American Physicians held at Washington, D. C., May, 1913. (See Transactions of the Association of American Physicians, 1913.)

Setting aside the question as to whether the dental involvement is the cause or effect of a general sepsis, the clinical fact remains that the material procurable from such foci frequently offers the only, and often brief, opportunity to identify the invading organism and of procuring materials from which vaccines may be made. I prefer to emphasize this feature of the subject, which is of so great diagnostic and therapeutic importance, rather than that of cause and effect, which, as a question of etiology, involves problems possibly unsolvable. The cases upon which this report is based have been studied in coöperation with Drs. M. I. Schamberg, Alexander Currie, W. D. Tracy, Harold S. Vaughan, dentists of New York City, three of whom are also graduates in medicine. Among the radiographs accompanying this article I have included those of cases which have come under the personal observation of these dentists through whose courtesy I am enabled to reproduce them here.

In using the term coöperation I do not mean to infer that the patients were told to consult the dentist merely, but I accompanied them to the dentist's office and studied with him the radiographs and local conditions. I believe such consultation to be as necessary as those common between surgeon and internist. When a pyogenic dental infection requiring liberation of the pus existed, arrangements were made for bacteriological specimens to be procured at the dentist's office, and later, if conditions indicated, a specimen of blood for culture and complement fixation tests was taken. A certain number of dentists are in accord with this practice: indeed, a small number have gone beyond the medical practitioner, and without his coöperation are studying cases with just such thoroughness as outlined above. There is, however, among the dentists a large class of dental tinkerers, who practice upon the easy persuasibility of the public. A large mass of mechanical work is thus done upon the teeth with often an entire neglect of the destructive focus of pus. A specific instance of this occurred in Case II. In this case there were (see case reports, Case II) areas of pus from which Streptococcus viridans in pure culture were obtained. These areas of pus were detected only by the radiograph, there being but slight local symptoms or signs. Into the roof of the mouth of this patient a dentist had inserted an elliptically curved bar of metal as large as the lead of a pencil, with possibly some idea of correcting a dental displacement, but with no correction of the pus focus. Subsequently this patient developed a cervical spondylitis, which cleared up shortly after draining the abscess cavities. One may even go farther and state that some of this mechanical work entraps pus which before such interference was draining into the mouth cavity, and thus at least lessening systemic absorption. Crown-work and filling are two common pieces of mechanical work which, if improperly done, may be a means of thus entrapping pus. A cavity in which a small quantity of pus is allowed to remain may harbor virulent organisms, which slowly extend the inflammation to the surrounding tissues, setting up large abscesses with active systemic absorption. Case IV illustrates the action of imperfect filling by producing irritation and inflammation (see case reports, Case IV). The radiograph in this case showed a shadow which was thought to be a pus area, but proved to be only thickening of the tissues. Cultures from all the suspected areas and from the root of the imperfectly filled tooth (which was drawn) were negative. There was, however, a positive fixation in the blood for three out of twelve strains of Streptococcus viridans. Four months prior there had been an acute abscess of a tooth not connected with this imperfect filling, but severe enough to cause pain and swelling and to require radical treatment. No cultures were taken at the time of the operation, but the positive fixation found later and the inflamed areas about to become purulent were significant. This case seems to fall into a group of cases of latent streptococcic infection in which faulty dental work would be a sufficient exciting cause to establish an active local process, with systemic absorption. The faulty dental technique in crown, filling, and other mechanical work here referred to is well known to dentists, and it is mentioned not as an arraignment of the dental profession, but for the information of the general practitioner. It may be further stated that so far from being at fault, the dentists must be given the credit of pioneer work in dealing radically with pyogenic infection in and about the teeth and in the use of radiography in detecting such conditions. Evidence of this is found in the writings of such dentists as A. Witzel,[2] L. C. Ingersoll,[3] W. J. Reese,[4] Louis Jack, C. N. Pierce,[5] and many others who published their observations between the years 1880 and 1900. While these were general considerations following the initial communication of John W. Riggs, of Hartford, Conn., which was made in October, 1875, they all showed an appreciation between these local dental conditions and systemic disturbances. The later writings of such dentists as M. I. Schamberg,[6] formerly of Philadelphia; Harold S. Vaughan,[7] of New York; Thomas L. Gilmer,[8] of Chicago, to mention a few only, show an even greater appreciation of a probable relation between oral sepsis and many serious systemic diseases, an appreciation not yet shown by the majority of general practitioners. Among medical men, William Hunter,[9] of London, and the late Dr. Kinnicutt,[10] of New York, have been in recent years the most active in bringing before the medical profession the importance of this subject.

There are two chief factors militating against the thorough investigation and prompt treatment of these cases:

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[2] Vierteljahresschrift f. Zahnheilkunde, 1882; British Jour. Den. Sci., xxv, 153.

[3] Ohio State Jour. Dent. Sci., 1881, i, 189.

[4] Dental Cosmos, 1880, xxv, 550

[5] International Journal, 1892, 1894 and 1895, xiii, xv and xvi.

[6] Dental Cosmos, January, 1906; Dental Brief, June, 1906.

[7] Jour. Allied Dent. Sci., March, 1913. (In this communication Vaughan shows the infection to be due to Vincent's bacteria without typical pus pockets.)

[8] Illinois Med. Jour., March, 1913.

[9] British Med. Jour., July, 1900.

[10] Proc. Roy. Soc. Med., April, 1913, vol. vi, Sup. No. 7, May, 1913.

1. The dentist and the internist, through the improved standards of dental work, are coming together more and more in consultation and coöperation. This was, however, not always the case, and recalls the relation which existed between the surgeon and physician in England in the days of coffee-house consultation, in which the druggist was the middleman. The physician in those days merited his lower position in the scientific world, and the surgeon justly felt that these doctor druggists were not men worthy to coöperate with. As the internist built up his diagnosis upon scientific research, it became possible for the surgeon to meet with him and study the case. Such is true also of the dental profession, and in 1904 the science had reached such a degree of accuracy that a section of dental surgery was established in the British Medical Association,[11] in which dentist and physician participate. Throughout the country today there is developing a class of dentists whose opinions are based upon carefully weighed evidence, and who are devising and carrying out operative measures as delicate in technique as some of the more important surgical operations. This first factor against the proper care of these cases can be best removed by the direct consultation between dentist and internist and their continued coöperation in the care of the case.

2. The second factor is the tenacity with which men and women alike will insist upon retaining rotten fangs in the mouth. The dentist regards the loss of a tooth as the internist does the death of a patient, and in this opinion the dentist has the insistent support of the patient. It is not an exaggeration to say that in saving certain teeth, the dentist may be condemning the patient to a living death through subsequent crippling arthritic infection or actual death through septic invasion of some vital organ. This factor can best be removed by educating the public, through the medium of the internist and dentist, to the realization of the seriousness of these conditions. When this is correctly understood by the patient, the removal of the offending teeth will be as readily consented to as tonsillotomy or the opening of a mastoid. Dr. Hunter,[12] has dealt very thoroughly with the obligation of the dentist in this matter, and his opinions are warmly supported by many of the best dentists. I believe, however, that some of his remarks may be taken with great directness by the internist, who is not infrequently the first under whose observation these cases come.

REPORT OF CASES.

CASE I.—W. W., female, aged thirty-five years. Married. April, 1912, complained of pain in the left ear, for which she was referred to a specialist, who reported subacute inflammation of the left Eustachian tube. She was under treatment for this from time to time during the summer, but her condition not improving, she consulted, of her own accord, another specialist and was told by him that he found nothing wrong with the throat, ear, or nose, and by him was referred back to me. October 7, 1912, the patient seen again by me, when the following notes were made.

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[11] British Med. Jour., November 19, 1904,

[12] Practitioner, December, 1900,

Complaint. Pain and tenderness located in the left ear. Distinctly audible crepitation of the left temporomaxillary joint.

Family History. Negative, except that one brother, aged forty-five years, is a victim of arthritis deformans, which began about nine years ago. He was acutely ill for several months, and while the joint condition was not progressive, he had occasional attacks of fever. He had been seen by several of the prominent consultants of this country. One sister (also under my care) has had septic infection of an antrum, for which she was treated by a specialist. Another sister had involvement of the small joints of the hands about the same time that the brother became infected.

Past History. Presented nothing of importance, except that wine was taken freely with meals and at other times also. The patient had one child. There was no history of miscarriages or pelvic infection.

Physical Examination. Presented nothing of importance that has not already been given. The patient was slender and of nervous temperament.

BLOOD EXAMINATION.

Hemoglobin (Fleischl)	78 per cent.
Red cells	5,200,000
White cells	7,400

DIFFERENTIAL COUNT OF WHITE CELLS.

Polynuclear neutrophiles	78 per cent.
Transitional cells	0 "
Large mononuclear cells	1 "
Large lymphocytes	0 "
Small lymphocytes	19 "
Eosinophiles	2 "
Mast cells	0 "
	100 "

Urine examination was negative.

October 12, 1912, the patient was seen in consultation with Dr. Currie (dentist), and radiographs of the temporomaxillary joint and teeth were studied. Nothing was observed in the joint, but suspicion was directed to a tooth, which it was determined to remove. In the socket and about the pulp of this tooth pus was found, cultures from which were taken by Dr. Hastings at the time of its removal. Bacteriological report was as follows: Cultures from the tooth, the tissue, and from the tooth socket gave pure Streptococcus viridans, and cultures from pus about the gum and about the tooth gave Streptococcus viridans and Staphylococcus aureus. A blood culture taken a few days later showed no bacteremia, but for seven strains of streptococci the fixation was negative for four strains, and positive for three strains of Streptococcus viridans. There was no fixation for the gonococcus, and the blood for lues was negative. We had, therefore, evidences of a local Streptococcus viridans abscess, with systemic absorption. That the temporomaxillary involvement was a manifestation of this sepsis was a reasonable conclusion, borne out by subsequent developments. The cultures were preserved for the purpose of employing vaccines at a later date should the removal of this tooth and a cleansing of the socket not prove curative, or should other joints show evidences of infection. The patient continued under general observation, with marked improvement of the ear condition. The crepitation of the temporomaxillary joint continued, but without pain or tenderness. In November, 1912, the patient went West, where she remained about two weeks. During this time she experienced, for the first time, pain in the ankles, knees, and wrists. There was no swelling, redness, or other local signs. On her return to New York, in the latter part of November, 1912, the pain continued in the joints noted, and extended to some of the finger-joints and to three toes of the right foot. The pain was worse in damp weather. This condition became sufficiently severe to alarm her, and on December 27 she reported to me. There was no fever and no local signs, except slight tenderness on moving the larger joints and on pressing some of the smaller joints. There was pain for the first time in the left temporomaxillary joint. There had been no chills or sweating. The knee-jerks were present. The pupils reacted normally, and there was no Romberg. It was decided to begin vaccine, and she received her first inoculation January 9, 1913. Up to April 21 she received twenty inoculations. By March 31, except for slight pain in a toe-joint of the right foot, the joints were free of all symptoms, a condition which up to that date had existed for about three weeks. She felt better than she had at any time for several years. The details of the vaccine therapy are omitted. By April 14, 1913, the patient complained of considerable tingling in the legs, and swelling and puffing of the feet. There was no fever, and though she had maintained her weight, and her appetite was good, she looked badly. April 21 she complained of feeling wretchedly; joints were more sensitive, and she noticed puffiness of the feet, especially at night. The diet and hygienic surroundings were carefully regulated and a tonic was prescribed and the vaccines were increased. She however continued to do badly. Blood examination showed the following:

BLOOD EXAMINATION.

Hemoglobin	100 per cent. (Sahli corrected)
Red-blood cells	4,720,000
White-blood cells	9,000

COLOR INDEX 1. DIFFERENTIAL COUNT.

Polynuclears	71 per cent. (300 counted)
Lymphocytes	19.6 "
Large mononuclears	5 "
Transitionals	3.6 "
Eosinophiles	0.6 "
Red-blood cells normal	

Blood negative for organisms, but the complement fixation was positive for the same strains of Streptococcus viridans as in the test made October, 1912.

On May 7 the teeth were again thoroughly radiographed, and though a careful study of these by two dentists and myself failed to detect pus shadows, Dr. Currie discovered a small area of pus near a devitalized tooth adjoining the seat of original infection. There was also impingement of a neighboring tooth, which accounted possibly for the pain. This tooth was removed and the area thoroughly curetted, when rapid improvement followed. The local pain entirely disappeared, and in two or three weeks the joints gradually ceased to cause trouble. The general health improved and except for occasional observations by the dentist the case passed from medical attention. The crepitation in the left temporomaxillary joint persisted, and had been sufficiently marked to be audible to those sitting nearby. This joint, therefore, was probably permanently damaged.

CASE II.—W. R., male, aged forty-four years, married; seen May 27, 1913; complained of pain and tenderness in the vertebral column about opposite the seventh cervical.

Past History. Presented nothing of importance. Had no children, and wife had had no miscarriages. Used alcohol and tobacco in moderation. Gave an indefinite history of some trouble with the knee-joint, which he attributed to trauma two years before; occasionally felt slight twinges of pain in this knee on motion. Had had slight pain at times in some of the toe-joints. Was an active business man.

Present History. Vertebral trouble began about January, 1913; not progressive and not noticeable when sitting or lying still. Up to June, 1912, took recreation in boxing, but since then on account of the neck condition, had not been able to do so. At times he feared to move because of the pain. In every other particular his general health was good.

Examination. A large, well-built, healthy looking man; dark complexioned, of American-German parentage. There was no pigmentation of the mucous membrane, and the skin pigmentation was uniformly distributed. Carried his head in a fixed position, suggesting "stiff neck." On lightly tapping the top of the head tenderness was localized to about the sixth cervical vertebra, at which point the pain was localized; there was also here well-marked tenderness on pressure. A radiograph disclosd no definite change at this articulation.

BLOOD EXAMINATION.

Hemoglobin (Fleischl)	85 per cent.
Red cells	6,016,000
White cells	6,000

DIFFERENTIAL COUNT.

Polynuclear	62 per cent.
Large lymphocytes	4 "
Small lymphocytes	26 "
Eosinophiles	3 "
Transitional cells	5 "
	100 "

Radiographs of the teeth were studied with the dentist, Dr. Currie, and suspicion was directed to the upper right canine and the upper incisor (see Figs. 2 and 6); in addition the dentist detected discharging pus from the upper right canine. On dealing with these teeth radically, pyorrhea, with marked destruction of the alveolus of the upper right canine, which was discharging, was found; also central necrosis of the right upper incisor, which, in Dr. Currie's opinion, was of some duration, together with a pus pocket in the lower left molar under an imperfectly fitting crown. Cultures by Dr. Mann gave Streptococcus viridans. The offending teeth were removed and all the infected areas thoroughly cleaned out. Tonic treatment was at the same time instituted. One week after this radical treatment the condition of the neck, which had existed for five months, markedly improved, and by the end of June entirely disappeared. This case had been under the observation of a dentist, who was consulted for the routine care of the teeth, and who entirely overlooked the purulent condition, inserting in the mouth the badly fitting crown and a bar for the correction of a suspected displacement.

CASE III.—J. J., female, aged forty years; married. Seen September, 1911. Pain and tenderness in left knee-joint.

Past History. Nothing of importance. Borne two healthy children; no miscarriages. Had been in uncertain health for some years, but condition was attributed to nervousness, nothing definite manifesting itself.

Present History. The present trouble began with pain and tenderness on the outer aspect of the left knee-joint, aggravated by walking. This joint was treated locally by an orthopedist, and after eight months of wearing a brace and being under general tonic treatment, baths, etc., other joints became painful, including the temporomaxillary joints, making the chewing of food and articulation difficult. One year after the initial knee condition, fever of an irregular type appeared. Eighteen months from the onset an intermittent odor of the breath was noticed, and this first attracted attention to the teeth, which had given only such signs as were considered common and unimportant. On thorough examination of the mouth, pus was found to exude from the gum about a molar tooth, which, being removed, disclosed a pus cavity in the gum, from which was obtained a dram of pus. From this pure culture of Streptococcus viridans was obtained. The jawbone was found to be partly involved in the purulent process. The patient sustained a typhoid temperature for four months, with the involvement of many of the large and small joints. Autogenous vaccine was used continuously over a period of three years. During this time phlebitis in one leg developed. For ten months there has been steady improvement in the general condition, but several of the joints seem permanently damaged, and the knee-joints are fixed (by a possible tendon or muscle shortening) at an angle of 45 degrees. This case will be published elsewhere in detail from the bacteriological, vaccine, and arthritis viewpoints. For this reason the above brief outline only is given.

CASE IV.—C. S., widow, aged forty-two years; complained of malaise, indigestion, and broken sleep.

Family History. Unimportant.

Past History. Showed repeated attacks of pharyngitis, and an acute attack of nephritis, without known cause, four years ago. Had not been robust for eight or ten years, but never confined to bed. Twenty-five years before a prominent specialist diagnosed a tuberculous apex in the right lung. From this she seemed to have entirely recovered. Appendicitis with operation six years before. Two years before had amenorrhœa for several months. Menses had been normal for over a year. Four months before, while travelling, developed a painful swelling over an upper left molar. This was treated by a dentist seen in the emergency, and he drained away a considerable amount of pus and directed her to see her dentist as soon as possible.

Present history dates from November 27, 1912, with complaint of pus about a molar four months before, as given above, but there is no trouble with the teeth at present. Patient was always an active woman, attending to her own affairs, but is now unable to go about without prostrating fatigue. Appetite is poor, and she sleeps but a few hours at night. For the first time in her life she finds relief in remaining in bed.

Examination. Skin pale, but mucous membrane of fairly good color. Chest negative except for soft systolic blow over the heart. Abdomen negative. Over both lower extremities were pinhead, purpuric spots. There had at no time been any joint pain or tenderness.

BLOOD EXAMINATION. DECEMBER 2, 1912.

Hemoglobin	90 per cent.
Red-blood corpuscles	5,600,000

DIFFERENTIAL COUNT.

Polymorphonuclears	61 per cent.
Transitionals	5 "
Lymphocytes	24 "
Large mononuclears	7 "
Eosinophiles	3 "

Urine Examination. Reaction, acid; sugar, none; pus, none; albumin, faintest possible trace; urea, 1 per cent.; casts, none; specific gravity, 1.018.

Blood Culture. Negative for organisms (agar and broth) for twelve strains of streptococci; the fixation was positive for three.

Examination of the Teeth. Pyorrhea pocket (see Figs. 2, 3 and 4) about a twelve-year molar. At the root of a filled tooth the radiograph showed a shadow, thought to be due to pus. Tooth was removed and filling was found to be incomplete, and from this inflammation extended into the surrounding tissues. Cultures from this area were negative. The shadow in the radiograph was due to thickening of the bone and peridental membrane, secondary to the inflammation. Though the cultures from the tooth were negative, the blood showed positive fixation for three out of twelve strains of Streptococcus viridans, and had this local condition remained untreated, an abscess would undoubtedly have developed, as was the case with the other side of the mouth four months previous.

This and Case II perhaps represent an early stage of a local streptococcic infection with systemic manifestations. In both cases the systemic manifestations rapidly disappeared after thorough local treatment. Such cases require careful watching for the possible development of new areas of infection.

CASE V.[13]—R. S., female, aged thirty years, unmarried; seen February, 1913, complaining of severe pain localized to the left tonsillar region and left ear. The pain radiates toward the mastoid and the neck posterior to the sternocleido muscle, with a centre apparently in the external auditory canal. A thorough examination of the throat and ear by a specialist revealed nothing. There was no fever. The teeth were found to be exceptionally good. There was, however, tenderness on slight pressure on the gum below and posterior to the lower left third molar; the gum was slightly red and puffy. Conditions suggested an abscess, but the radiograph revealed a wisdom tooth impinging directly upon the molar and crowding that tooth (see Fig. 1). This condition, known in dentistry as "impaction," is a frequent cause of reflex pain, and without the use of the radiograph leads to much surmise with regard to possible mastoid and middle-ear disease, retrotonsillar, deep gum, and dental abscesses. These cases are frequently treated by lancing the gum in the hope of liberating supposedly entrapped pus. The loss of sleep on account of the pain and disturbed digestion not infrequently lead to the impression of a systemic condition secondary to the supposed abscess. This case was surgically treated by Dr. Schamberg, who removed the offending tooth after which the patient was entirely relieved.

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[13] This case represents a class well-known to dentists, but one with which general practitioners are usually unfamiliar. It is introduced here, however, for the information of the general practitioner in order that he may distinguish it from beginning dental sepsis, with which it can be readily confused.

SUMMARY. These cases are selected as representing five important features of general disturbance of the system, secondary to dental disease. In the first case, the dental disease was detected in part and the organism determined before the joint complications developed. The use of autogenous vaccine in this case would seem to have held the progress of the disease in check, but not until all of the pus areas in the teeth had been cleaned out did the systemic condition show a permanent improvement. The system, however, was probably under the influence of toxic absorption for some months before radical measures were instituted. In such cases there is always a possibility of new and independent foci of infection having been set up. Such a stage in the development of the disease precludes the possibility of checking it by dealing with the original focus merely, and it would seem here that vaccines are our only means of combating the infection. This is true of Case III, in which neither the organism was detected nor the autogenous vaccine employed until many months after the system had been under the influence of the infection and many joints involved, but this case also represents the ravages of septic infection of dental origin unchecked, as was common with all cases before the teeth were suspected as the original focus. Cases II and III represent possibly the earliest stage in the systemic manifestation of absorption of toxins from a dental source. Case V represents a class in which mechanical disturbance may be mistaken for an inflammatory process. From these cases and others the following symptoms and signs may be classified. In attempting a classification, it should be stated that cases of this type have not, as yet, been studied by internists and dentists together sufficiently to make such a classification complete. It should also be stated that there are a number of characteristics which may prove of great clinical value when corroborated by thorough observation, but which for lack of such corroboration are omitted here. Such, for example, are the association of joint involvements in which the upper jaw is the seat of pyogenic infection in contradistinction to an adenitis and burrowing pus when the lower jaw is involved. Again, what degree of alveolar destruction is necessary before systemic absorption takes place? Also, is there any relation between tonsillar and peritonsillar and faucial infections and dental disease? In this connection, Dr. Vaughan's[14] observations with regard to Vincent's bacteria and dental disease are pertinent. We are as yet without any conclusive studies on the lymphatic system draining such areas.

SYMPTOMS. Malaise, indigestion, fetor of the breath, often intermittent; there may be periods in which the breath is so offensive as to be noticeable some little distance from the patient, while at other times such fetor cannot be detected by careful search. This is frequently called attention to by others, and is rarely noticed by the patient. Loosening of the teeth, which may also be intermittent. Tenderness of the teeth on chewing; an indefinable aching of the gums; pain referred to the ear (internal and external), the mastoid, the cheek bone, the eyes, and fauces. Rapid and sometimes copious loss of hair, which may occur intermittently. All the frank manifestations, such as acute pain and swelling, which immediately attract attention to the teeth, are omitted here, though of course they come into this classification.

SIGNS. A brick-red tinge about a sixteenth of an inch in width at the dentogingival margin, quite distinct from the whitish-red color of the healthy gum, marks areas of infection. These areas bleed readily on slight pressure. If a wooden spatula is run along the gum margin the diseased portions can frequently be detected by the bleeding-points left in the wake of such pressure. In more advanced cases a diseased tooth, from loosening, can be moved in its socket; a healthy tooth is absolutely immobile. Again, the gross signs, such as destruction of the cemental portions, surface necroses, and visible discharge of pus, together with more obscure signs requiring instrumental examination by a dentist, are not mentioned here in detail, though they of course belong under this head. The most important point in connection with both symptoms and signs is that manifestations of systemic involvement may appear without there being any symptom referable to the teeth in which actively absorbing pus areas may be present. Such systemic manifestations, however, show marked improvement, and sometimes completely disappear with the radical removal of the septic focus. Paramount among these systemic manifestations are arthritis and phlebitis. It is a noteworthy fact, however, that not until an overwhelming sepsis has developed does one procure cultures of any organism from the blood or the joint fluid. A positive complement deviation, on the other hand, from the blood is a fairly uniform finding. Fever, except in advanced cases of systemic involvement, is not common. Grave anemia of oligochromemic type may be present

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[14] H. S. Vaughan, Jour. Allied Dent. Soc., December 2, 1912.

FIG. 1

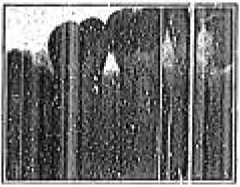

FIG. 2

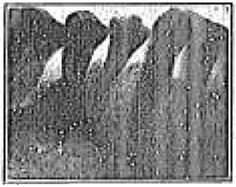

FIG. 1.—Normal teeth, for comparison. The roots will be seen to blend with the gum, showing no areas between the teeth and gum. The gum fits snugly up to the teeth, all the way up and between the roots. There is, however, in this case an impacted molar which can be seen (to the left of the picture) impinging on its neighbor. This condition may give reflex pain in the ear, neck, etc., and may be mistaken for pus formation (see Case V). It is a favorable location for the development of pus.

FIG. 2.[11]—Simple pyorrhea pockets, early stage (left lower first molar).

FIG. 3

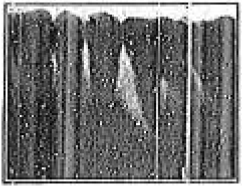

FIG. 4

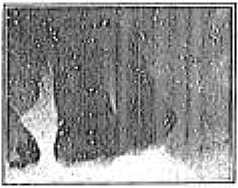

FIG. 3.[11]—Simple pyorrhea pockets; more advanced stage; no involvement elsewhere.

FIG. 4.[11]—Typical pyorrhea alveolaris; no involvement of pulp.

in the early stage of dental sepsis. Oligocythemia occurs in cases in which the system has been involved for some time. Grave secondary anemia may develop in such cases. Polynuclear leukocytosis or increase in the number of the white cells is rarely found, even when large pus areas exist in and about the teeth. Glandular enlargement seems to occur more commonly with lower than with

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[11] If the general health is not taxed by bad food and bad air, overwork, worry, etc., the condition shown in Figs. 2, 3, and 4 may exist for long periods with or without local manifestation, but usually with moderate systemic disturbance (see Case IV). With the extension of the local process to the tooth or surrounding tissues or with deterioration in health from any cause, the system may become suddenly and seriously involved. (See Case II.)

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upper-jaw involvement. The submental and cervical glands are those usually affected.

Fig. 5

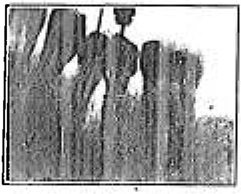

Fig. 6

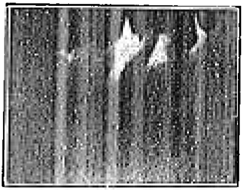

Fig. 5.—Pus in a bifurcation, discharging into the mouth. Distruction of tooth and systemic absorption imminent.

Fig. 6.—Pus pockets with necrosed roots under crowns; systemic absorption active. (See Case II.)

Fig. 7

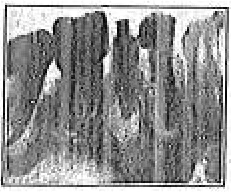

Fig. 8

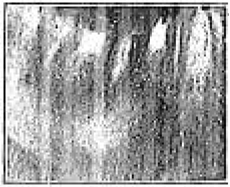

Fig. 7.—Abscesses over bicuspid roots. Advanced stage. Systemic absorption active.

Fig. 8.—Large abscess cavity in lower jaw; considerable loss of bone through septic process.

Fig. 9

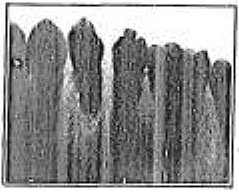

Fig. 10

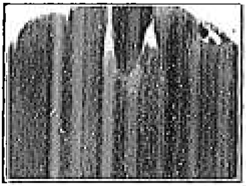

Fig. 9.—Chronic abscess; tooth structure entirely destroyed; tooth floating. No local symptoms, except mobility of tooth and sinking of tooth when patient chewed.

Fig. 10.—Absorption of root by abscess.

Differential Diagnosis. While the occurrence of pus in and about the teeth has been found to be the cause of serious sepsis in various parts of the system in a large number of cases, the search for primary foci of pus other than the teeth must be thorough. The deep urethra, the tonsils, the peritonsillar tissues, the antrum,

FIG. 11

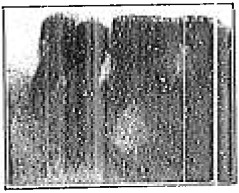

FIG. 12

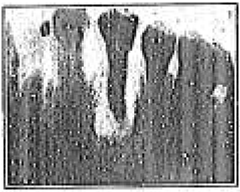

FIG. 11.—Advanced abscess; no signs or symptoms; detected by radiograph only.
FIG. 12.—Chronic abscess.

FIG. 13

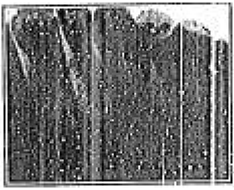

FIG. 14

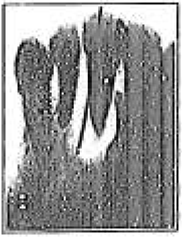

FIG. 13.—Combined Riggs' disease and dental abscess; chronic abscess with fistula; pulp extensively involved.
FIG. 14.—Perforated root; considerable loss of bone.

FIG. 15

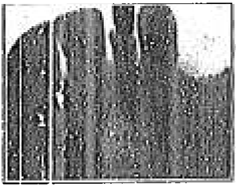

FIG. 15.—Chronic abscess; lateral root; pus draining through canal of pulp; absorption until pus was liberated.

the posterior nares, must all be excluded. The testing out of the blood for complement deviation for various organisms may prove the most direct evidence in the absence of local manifestation. It may be well to repeat that the blood gives negative cultures unless an advanced degree of sepsis has developed, and in such cases the condition has usually gone beyond the stage in which it can be influenced either by local, general, or vaccine treatment. Case III, while the condition remained localized to one knee, was suspected of being tuberculous. Its real character was detected only when pure cultures of Streptococcus viridans from the tooth abscess and a positive complement fixation of the blood for the same organism were obtained, the blood otherwise being negative. Fluid from the knee-joint was also negative.

Radiographs of the teeth should be placed first among the means of detecting pathological conditions in the jaw. In some instances, for example where the pus lies in a thin layer over the tooth and not in sufficient quantity to produce a pocket, nothing may appear on the plate. This occurred in Case I, when by a second examination the pus was reached by probing only.

Reference has already been made to impaction and misplacement, with the consequent swelling and reflex pain which may simulate these septic conditions.

TREATMENT. A realization that one is dealing with abscess cavities, due possibly to the most virulent organisms, with the inevitable absorption of destructive toxins, is essential to the prompt and radical care of these cases. While it is true that the teeth (and possibly the tissues about them) resist the entry of organisms themselves into the system, the possibility of a bacteriemia always threatens such cases, with probably the development of new foci of pus in the endocardium and other like vital organs. Abscesses in and about the teeth should be attacked with the same energy as pus foci in any other part of the body. Infected teeth should either be removed entire or in part by operating above the tooth through the gum, an operation now done with great skill by many dental surgeons. Cultures should always be taken at *the time of the removal of the tooth or the operation*, and in the event of a positive culture, vaccines should be prepared and stocked in case they may be needed at some later date. Filling of the teeth and temporizing with a hope of saving a tooth which has been attacked by pus should only be permitted after careful consultation with a competent dentist. The physician is under obligation to the patient to make him realize the seriousness of the possible consequences of the seemingly unimportant condition of the teeth. This part of the treatment cannot be too strongly emphasized, and the responsibility of temporizing with or retaining septic teeth should be placed by the physician and dentist upon the patient.

Through the courtesy of Drs. Vaughan and Tracey, already mentioned, I have the opportunity of showing radiographs illustrating the cases reported here as well as the location and distribution of pus in and about the teeth and gums.